A.D. 1880, 24th JULY. N° 3063.

Manufacture of Spirit.

LETTERS PATENT to John McGaan and William Oliphant Glassford, both of 38, Dale Street, Liverpool, for an Invention of "IMPROVEMENTS IN THE MANUFACTURE OF SPIRIT."

PROVISIONAL SPECIFICATION left by the said John McGaan and William Oliphant Glassford at the Office of the Commissioners of Patents on the 24th July 1880.

JOHN MCGAAN and WILLIAM OLIPHANT GLASSFORD, both of 38, Dale Street, Liverpool. "IMPROVEMENTS IN THE MANUFACTURE OF SPIRIT."

This Invention has for its object improvements in the manufacture of spirit.

In a Provisional Specification filed by one of us, namely, by me, John McGaan, on the 5th day of February in the present year, No. 512, a process is described a main of which is to save to the distiller the inconveniences which he now suffers owing to the residues of the grain from which he prepares the wash for distilling. According to the said process a finished glucose is first prepared from the grain, and the difficulty in fermenting the glucose by yeast or like ferment is overcome by the addition of a suitable yeast food.

There are however many distillers so situate that they can dispose of their residues without serious trouble. In such cases the following process which we have invented is conveniently and advantageously applied, and an increased yield and improved quality of spirit is obtained. The grain in the form of meal is digested under pressure in sulphuric acid diluted with water, in the manner well understood, for the conversion of the starch of the grain into glucose. The contents of the boiler are run out and the acid is neutralized with lime. The residue is separated and the liquor is at once fermented by the addition of yeast, or it might be wine ferment, and by the addition also of a material upon which the ferment can feed; malt, or extract of malt, or suitable mineral salts may be employed. When the fermentation is complete the distillation of the wash is conducted in the usual manner.

In place of converting the whole of the starch of the grain into glucose by digesting under pressure with acid this process may be stopped short whilst some

starch still remains unconverted, and after coming out of the boiler and being neutralized the product may be submitted to a mashing process with malt. The effect of the mashing will be to convert the remaining starch into maltose and dextrine, of which the former will afterwards yield spirit, but the latter is unfermentable and is ultimately wasted; therefore the highest yield of spirit will be obtained when the whole, or practically the whole, of the starch is converted into glucose. We would remark that at present meal is used in some distilleries, and it is digested with sulphuric acid and water, but the digestion is always carried on without pressure, under which condition only a few per cent. at the most of the starch is converted into glucose, and the great bulk of the starch of the meal is left to be converted into maltose and dextrine by a subsequent mashing operation; this is a wasteful process as compared with the conversion of the starch into glucose. The essential feature of our improvement is the digestion with dilute acid under pressure, and subsequently the fermentation of the product or liquor drawn from the boiler so as to convert it direct into wash for distilling. If the digestion under pressure be arrested whilst a notable quantity of starch remains unconverted a mashing process is necessary before the fermentation, but if practically the whole of the starch has been converted into glucose then after neutralization the liquor has only to be reduced to a proper gravity to be ready for the addition of the yeast and yeast food.

SPECIFICATION in pursuance of the conditions of the Letters Patent filed by the said John McGaan and William Oliphant Glassford in the Great Seal Patent Office on the 21st January 1881.

JOHN M°GAAN and WILLIAM OLIPHANT GLASSFORD, both of 38, Dale Street, Liverpool. "IMPROVEMENTS IN THE MANUFACTURE OF SPIRIT."

This Invention has for its object improvements in the manufacture of spirit.

In a Provisional Specification filed by one of us, namely, by me, John McGaan, on the 5th day of February in the present year, No. 512, and upon which a Patent has since been granted, a process is described a main object of which is to save to the distiller the inconveniences which he now suffers owing to the residues of the grain from which he prepares the wash for distilling. According to the said process a finished glucose is first prepared from grain, and the difficulty in fermenting the glucose by yeast or like ferment is overcome by the addition of a suitable yeast food.

There are however many distillers so situate that they can dispose of their residues without serious trouble. In such cases the following process which we have invented is conveniently and advantageously applied, and an increased yield and improved quality of spirit is obtained. The grain previously crushed is digested under pressure with sulphuric or other acids diluted with water, in the manner well understood, for the conversion of the starch of the grain into glucose, for example, that is to say, the crushed grain is mixed with about three times its weight of water and three parts of real sulphuric acid to 100 parts of corn, and having digested for some time the mixture is transferred to a strong metal "convertor," where it is subjected to a high temperature by injecting steam of a pressure of about 80lbs. to the square inch, and the pressure is maintained for about six minutes. The contents of the boiler are run out and the acid is neutralized with lime. The residue is separated, for which purpose a filter press may be employed, and the liquor, having been brought to a proper specific gravity and temperature is at once fermented by the addition of yeast or ferment, and by the addition also of a material upon which the ferment can feed; malt, or extract of malt, or suitable mineral salts may be employed, as is described in the Specification of the Patent, No. 512, in the year 1880, to which reference has already been made. Malt extract is the yeast food which we generally find to be the best. We add three quarters of a part by weight of well drained yeast for every hundred parts of actual glucose in solution. Also as a yeast food we add the clear extract or wort obtained by mashing from 5 to 10 parts of malt per hundred parts of glucose. The liquor should be set for fermentation at a temperature of about 25° C. and at a specific gravity of 1·055 (water being 1·000). When the fermentation is complete the distillation of the wash is conducted in the usual manner.

If it should be preferred to use as yeast food the mineral salts already referred to the cost of neutralizing sulphuric acid with lime and filtering off the sulphate of lime may be avoided by the substitution for sulphuric acid of other acids as follows:—

Tribasic phosphoric acid, about ·5 parts per 100 parts of corn.
Tartaric acid - „ ·86 „ „ „

In this case the pressure is maintained at about 80lbs. per square inch for about 10 minutes, the liquor is run out, brought to the proper specific gravity and temperature, and the following salts added:—

Potassium carbonate, about 1·3 parts per 100 of grain used.
„ silicate „ ·03 „ „ „ „
Ammonium carbonate „ ·56 „ „ „ „
Ferrous sulphate „ ·17 „ „ „ „

Yeast is then added and the fermentation allowed to proceed to complete attenuation and the wash distilled as before.

M°Gaan & Glassford's Improvements in the Manufacture of Spirit.

In place of converting the whole of the starch of the grain, or it might be other starchy material, into glucose by digesting under pressure with acid, this process may be stopped short whilst some starch still remains unconverted; and after coming out of the boiler and being neutralized the product may be submitted to a mashing process with malt. The effect of the mashing will be to convert the remaining starch into maltose and dextrine, of which the former will afterwards yield spirit, but the latter is unfermentable and is ultimately wasted; therefore the highest yield of spirit will be obtained when the whole, or practically the whole, of the starch is converted into glucose.

We would remark that at present meal is used in some distilleries, and it is digested with sulphuric acid and water, but the digestion is always carried on without pressure, under which condition only a few per cent. at the most of the starch is converted into glucose, and the great bulk of the starch of the meal is left to be converted into maltose and dextrine by a subsequent mashing operation; this is a wasteful process as compared with the conversion of the starch into glucose.

The essential feature of our improvement is the digestion with dilute acid under pressure, and subsequently the fermentation by the aid of an added yeast food and yeast of the product or liquor drawn from the boiler so as to convert it direct into wash for distilling. If the digestion under pressure be arrested whilst a notable quantity of starch remains unconverted a mashing process is necessary before the fermentation, but if practically the whole of the starch has been converted into glucose then after neutralization the liquor has only to be reduced to a proper gravity to be ready for the addition of the yeast and yeast food.

In place of yeast a wine ferment may be employed where this is more readily obtainable.

Having thus described the nature of our said Invention, and the manner of performing the same, we would have it understood that we claim,—

The manufacture of spirit by treating under pressure in a closed boiler crushed maize or other grain or other starch containing material with dilute acid and water so as to obtain a solution of glucose, which solution (after suitable preparatory treatment) is fermented by the aid of yeast food and yeast or like ferment and then distilled, substantially as described.

In witness whereof, I, the said John McGaan, have hereunto set my hand and seal, this Twentieth day of January, in the year of our Lord One thousand eight hundred and eighty one.

JNO. M°GAAN. (L.S.)

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